International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 5 Issue 5, July-August 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Optical Network without Fiber Optical Cable for Communication

Darnesh

Teacher, Ahmedabad, Gujarat, India

ABSTRACT

Fiber optic cable is in extensive use in present era for communication. But still there is need for up gradation of fiber optic communication network. Can we go for wireless(without fiber optic cable) optical network for communication by using waves length of visible spectrum or other waves?

How to cite this paper: Darnesh "Optical Network without Fiber Optical Cable for Communication" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-5, August 2021, pp.1796-1798, URL: www.ijtsrd.com/papers/ijtsrd45215.pdf

IJTSRD45215

Let us understand by below examples and methodology.

Visible Light:

What is Visible Light in the Electromagnetic Spectrum?

Visible light sits in the region with ultraviolet (UV) to the left of the spectrum and infrared (IR) to the right. It is a form of electromagnetic radiation which can be subdivided into seven colors.

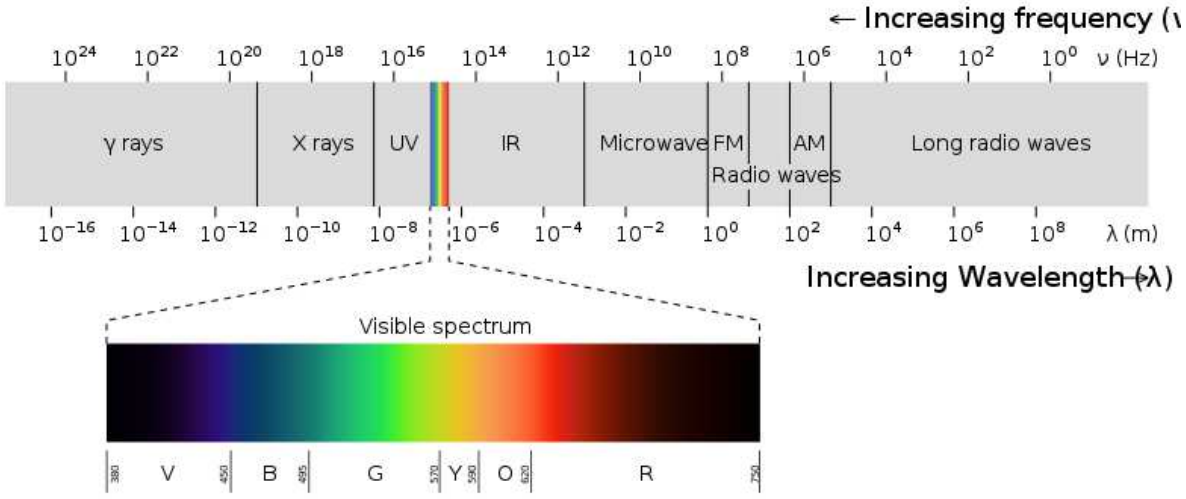
It's probably the most familiar to you because it is the only region on the spectrum that is visible to most human eyes.

"This part of the spectrum includes a range of different colors that all represent a particular wavelength. Rainbows are formed in this way; light passes through matter in which it is absorbed or reflected based on its wavelength. Thus, some colors are reflected more than others, leading to the creation of a rainbow."

One of the most important characteristics of Visible light is color.

Colors of the Visible Light Spectrum:

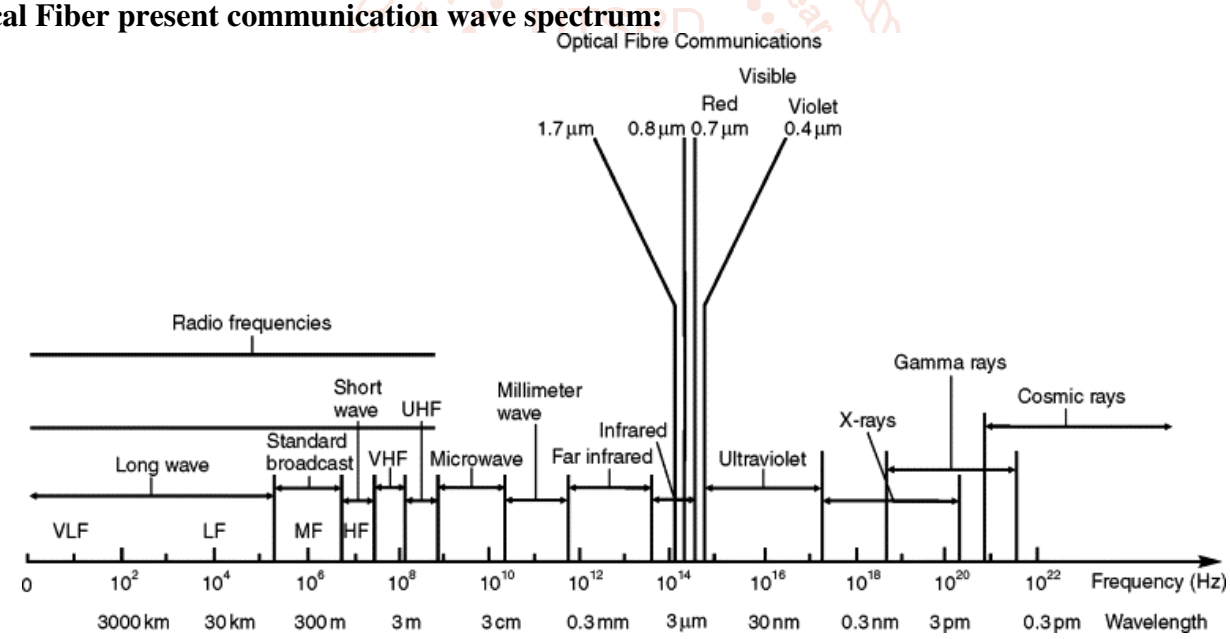
There are seven wavelength ranges in the visible spectrum that coordinate to a different color. Each visible color has a wavelength. As you move from red to violet, the wavelength decreases and energy increases.



Here are the 7 from shortest to longest wavelength.

1. **Violet** - shortest wavelength, around 400-420 nanometers with highest frequency. They carry the most energy.
2. **Indigo** - 420 - 440 nm
3. **Blue** - 440 - 490 nm
4. **Green** - 490 - 570 nm
5. **Yellow** - 570 - 585 nm
6. **Orange** - 585 - 620 nm
7. **Red** - longest wavelength, at around 620 - 780 nanometers with lowest Frequency

Optical Fiber present communication wave spectrum:



Bandwidth and Data Rate:

Bandwidth:

Bandwidth is defined as the potential of the data that is to be transferred in a specific period of time. It is the data carrying capacity of the network or transmission medium. In simple words, it is the maximum amount of data that can be transferred per second on a link. It is generally measured in bits per second(bps), Mega bits per second(Mbps) or Giga bits per second(Gbps).

For example, if bandwidth is 100 Mbps, it means maximum 100 Mb data can be transferred per second on that channel.

Data Rate:

Data Rate is defined as the amount of data transmitted during a specified time period over a network. It is the speed at which data is transferred from one device to another or between a peripheral device and the computer. It is generally measured in Mega bits per second(Mbps) or Mega bytes per second(MBps).

For example, if bandwidth is 100 Mbps but data rate is 50 Mbps, it means maximum 100 Mb data can be transferred but channel is transmitting only 50 Mb data per second.

Present Bandwidth and data rate of fiber optical network:

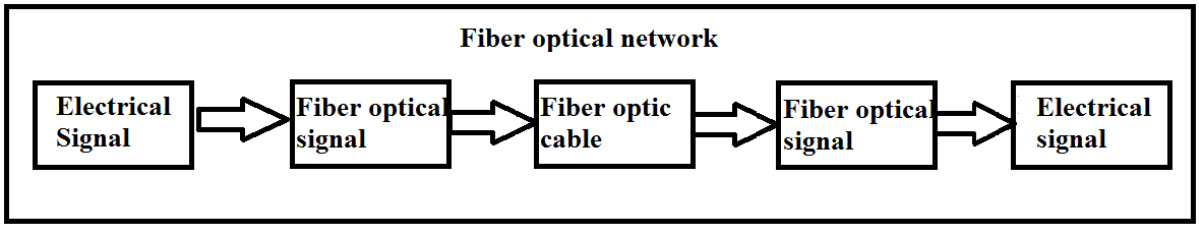
At present fiber optical cable signal carrying speed is about 2/3'rd speed of light. And data transfer rate is about 500 giga bites (Gbit/s) per second.

Bandwidth and data transfer rate of Wireless visible spectrum wave network:

If this fiber optic cable is replaced by wireless visible spectrum wave network, than signal speed could become as similar as speed of light, and data transfer rate could be around from minimum 1 Tera bites (Tbit/s) to maximum 299 Tera bites(Tbit/s) per second.

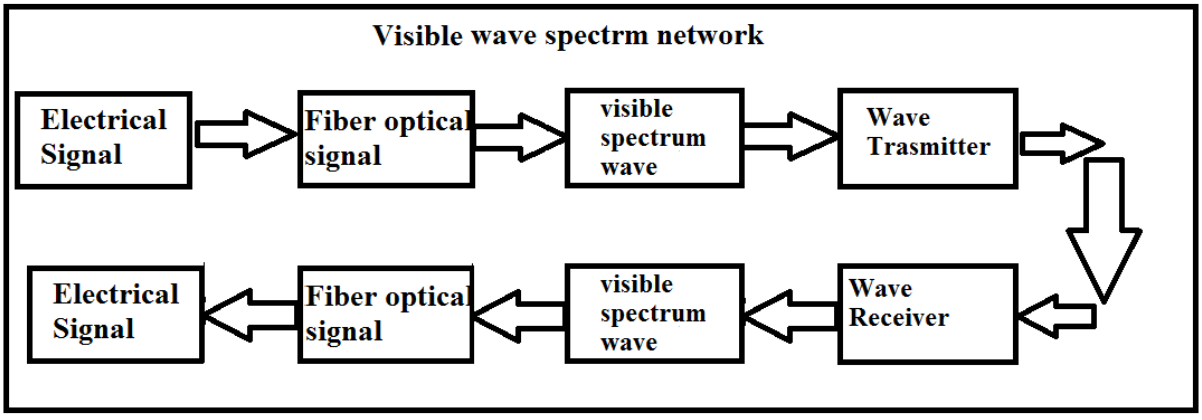
Data transfer rate could be increased further as increasing frequency of waves.

Traditional fiber optical network:



In present scenario, first electrical signal is converted into fiber optical signal through optical panel, than signal is transmitted through transmitters over fiber optic cable till the receiver panel, after receiving signal at receiver panel, again it is converted into electrical signal.

Example of Visible spectrum wave network:



By introducing new visible wave spectrum network, firstly it converts electrical signals into fiber optical signals than signal is converted into visible spectrum wave range, after that wave is transmitted over desire distance, at the receiver end signal is received and changed into fiber optic signal and lastly it becomes electrical signal.

Conclusion:

By introducing new wireless technology, signal carrying speed could increase by 30 % and data transfer rates becomes more than thousand times than present fiber optical network system. Moreover it could save material , labour, manufacturing ,maintenance cost of fiber optic cable. There is no possibility of mixing of new visible spectrum signals(THZ) with other mobile(MHZ/GHZ) or radio(MHZ) or other televison signals(GHZ). It will safe and secure and reliable network.

References:

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